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Remarks

The present invention relates to a method of removing polymer generated in a semiconductor manufacturing process. The semiconductor manufacturing process includes sequentially depositing a lower metal layer, an insulating layer and an upper metal layer on a semiconductor substrate, forming a photoresist pattern on the upper metal layer, and etching the upper metal layer and the insulating layer using the photoresist pattern as a mask. The polymer is generated during the etching step. The method of removing polymer (as set forth in amended Claim 1 above) generally comprises:

- (a) removing the photoresist pattern by using O_2/N_2 plasma; and
- (b) removing the polymer existing on the lower metal layer by using H_2O/CF_4 plasma.

Alternatively, the present invention relates to a method of removing polymer (as set forth in new Claim 10 above) that generally comprises:

- a) removing the first photoresist pattern by ashing with a first plasma from a first gas mixture consisting essentially of O_2 and N_2 ; and
- b) removing the polymer on the lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H_2O and CF_4 .

The reference cited against the claims (Jung, U.S. Pat. Appl. Publ. No. 2003/0114010 [hereinafter "Jung"]) is believed to neither disclose nor suggest removing a photoresist pattern by using a plasma of O_2 and N_2 , or removing a polymer from a lower metal layer by using a plasma of H_2O and CF_4 (see amended Claims 1 and 8 above). Furthermore, the cited reference neither discloses nor suggests removing a photoresist pattern by ashing with a first plasma from a first gas mixture consisting essentially of O_2 and N_2 , and removing a polymer on a lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H_2O and CF_4 (see new Claim 10). Consequently, the present claims are patentable over the cited references.

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The Rejection of Claims 1-9 under 35 U.S.C. § 103(a)

The rejection of Claims 1-9 under 35 U.S.C. § 103(a) as being unpatentable over the "Background" disclosure in the present application (hereinafter, "Applicant's discussion of the background") in view of Jung is respectfully traversed.

First and foremost, neither Applicant nor Applicant's representatives have, at any time, stated, indicated, admitted, or otherwise suggested that the discussion of the background of the present application constitutes prior art that is available against the present claims under any section of 35 U.S.C. § 102 et seq. Applicant's undersigned representative strongly objects to any characterization of Applicant's discussion of the background as an admission of prior art by Applicant. Such use of Applicant's disclosure against him in prosecution discourages full and complete disclosure of all relevant information to the U.S. Patent and Trademark Office (USPTO), thus appearing to violate the USPTO's regulations and long-standing policy encouraging such disclosure (see, e.g., 37 C.F.R. §§ 1.56, 1.98 and 1.99, M.P.E.P. §§ 609 and 706.02(c), and particularly M.P.E.P. § 2129, which appears to require a statement "identifying the work of another as 'prior art'" in order to constitute an admission that the work is available as prior art against the claims"). There is no such statement in either Applicant's discussion of the background or anywhere else in the present application that the process discussed with regard to FIGS. 1A-1D is prior art, and the inclusion of a "Prior Art" label on FIGS. 1A-1D by Applicant's previous representatives in response to the requirement by the Examiner appears to have been in error, given that there is no such admission in the specification.

If such information is actually prior art available against the pending claims, then a reference or other publication available under 35 U.S.C. § 102 and disclosing the same should be located and properly cited. Alternatively, the Examiner can take official notice that Applicant's discussion of the background are commonly known in the art (or, perhaps, that somehow Applicant has admitted that the discussion of the background is available as prior art) and rely on

* Mere inclusion in the background section of an application does not appear to be sufficient. Applicant's undersigned representative is not aware of any statutory, regulatory or policy basis for presuming or concluding that

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a self-executed Affidavit attesting to his personal knowledge of facts establishing such technology as prior art available under 35 U.S.C. § 102 against the claims:

"If the examiner is relying on personal knowledge to support the finding of what is known in the art, the examiner must provide an affidavit or declaration setting forth specific factual statements and explanation to support the finding." M.P.E.P. § 2144.03, citing 37 C.F.R. 1.104(d)(2).

Applicants have traversed all effective assertions of official notice that Applicant's discussion of the background is admitted prior art or is otherwise available as prior art. Consequently, any successive Office Action must provide documentary evidence if the rejection is to be maintained. See M.P.E.P. § 2144.03; see also *In re Zurko*, 258 F.3d at 1386, 59 USPQ2d at 1697 ("[T]he Board [or examiner] must point to some concrete evidence in the record in support of these findings" to satisfy the substantial evidence test).

However, instead of rejecting the claims on a proper basis formed from facts established through available prior art, Applicant's disclosure has been used against him in a manner defeating a primary purpose of the U.S. patent system (full and complete disclosure of the invention) and effectively punishing Applicant for complying with his duty to disclose all relevant and/or material information known to those associated therewith.^b

Nonetheless, Applicant's discussion of the background discloses technology generally considered to be conventional. As such, Applicant does not intend to claim subject matter disclosed in the discussion of the background of the present application. The present invention represents an improvement over the subject matter disclosed in the background discussion of the present application.

That being said, assuming for the sake of argument that the technology shown in Applicant's discussion of the background is available as prior art against the present claims, the

any disclosure in the background section of an application is an admission that such disclosure constitutes prior art available against the claims.

^b See, e.g., the Patent Act of 1790, ch. 7, §§ 2 and 6, 1 Stat. 109 (in part, making it a defense to a suit for infringement that the specification "does not contain the whole of the truth concerning (the) invention"); see also *Chisum on Patents*, §§ 11.03[4] and 19.03.

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background discussion in the present application neither discloses nor suggests removing a photoresist pattern by using an O₂ / N₂ plasma, or removing a polymer from a lower metal layer by using an H₂O / CF₄ plasma, as recited in Claims 1 and 8 (and claims dependent therefrom). Furthermore, Applicant's discussion of the background neither discloses nor suggests removing a photoresist pattern by ashing with a first plasma from a first gas mixture consisting essentially of O₂ and N₂, and removing a polymer on a lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H₂O and CF₄ (see new Claim 10).

Jung discloses a method for fabricating a semiconductor device which includes methods of photoresist stripping and cleaning, which shows a favorable contact resistance by performing dry cleaning while stripping a photoresist and effectively removing the residue formed on contact holes (see paragraph [0013]). In a first step, the polymers on the sidewalls are removed in a mixed gas atmosphere of N₂H₂, H₂O, CF₄ and O₂ by using RF power and microwave (see paragraphs [0019]-[0020] and [0047]). In a second step, Jung removes a photoresist in a mixed gas atmosphere of N₂, CF₄ and O₂ (see paragraphs [0021] and [0048]), and in a third step, the residue on the bottom of via holes is removed in a mixed gas atmosphere of N₂, H₂O, CF₄ and O₂ by using a microwave (see paragraphs [0022] and [0049]).

It is believed that the composition of plasma gases is a critical factor in plasma etch processes. For example, the selectivity, rate and efficiency of a plasma etch process is believed to depend on the composition of plasma gases, in some cases rather dramatically. However, Jung discloses use of gases in addition to O₂ and N₂ to remove a photoresist pattern, and gases in addition to H₂O and CF₄ to remove a polymer on a metal layer. Thus, Jung is believed to be saliently deficient with regard to the present Claims 1 and 8. Furthermore, because Jung discloses use of gases in addition to O₂ and N₂ to remove a photoresist pattern and gases in addition to H₂O and CF₄ to remove a polymer on a metal layer that are believed to affect plasma etch process parameters such as selectivity, rate and efficiency, it is believed that Jung fails to cure the deficiencies of Applicant's discussion of the background with regard to the present Claim 10 (i.e., removing a photoresist pattern by ashing with a first plasma from a first gas

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mixture consisting essentially of O_2 and N_2 , and removing a polymer on a lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H_2O and CF_4).

As a result, the combination of Applicant's discussion of the background and Jung fails to disclose or suggest (i) removing a photoresist pattern by using an O_2 / N_2 plasma and/or (ii) or removing a polymer from a lower metal layer by using an H_2O / CF_4 plasma, as recited in Claims 1 and 8 above, or (iii) removing a photoresist pattern by ashing with a first plasma from a first gas mixture consisting essentially of O_2 and N_2 , and removing a polymer on a lower metal layer by ashing with a second plasma from a second gas mixture consisting essentially of H_2O and CF_4 , as recited in new Claim 10 above. Consequently, this ground of rejection is unsustainable, and should be withdrawn.

The Objection to Claim 5

The objection to Claim 5 has been overcome by appropriate amendment.

Conclusions

In view of the above amendments and remarks, all bases for objection and rejection are believed to be overcome, and the application is believed to be in condition for allowance. Early notice to that effect is earnestly requested.

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If it is deemed helpful or beneficial to the efficient prosecution of the present application,
the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,



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